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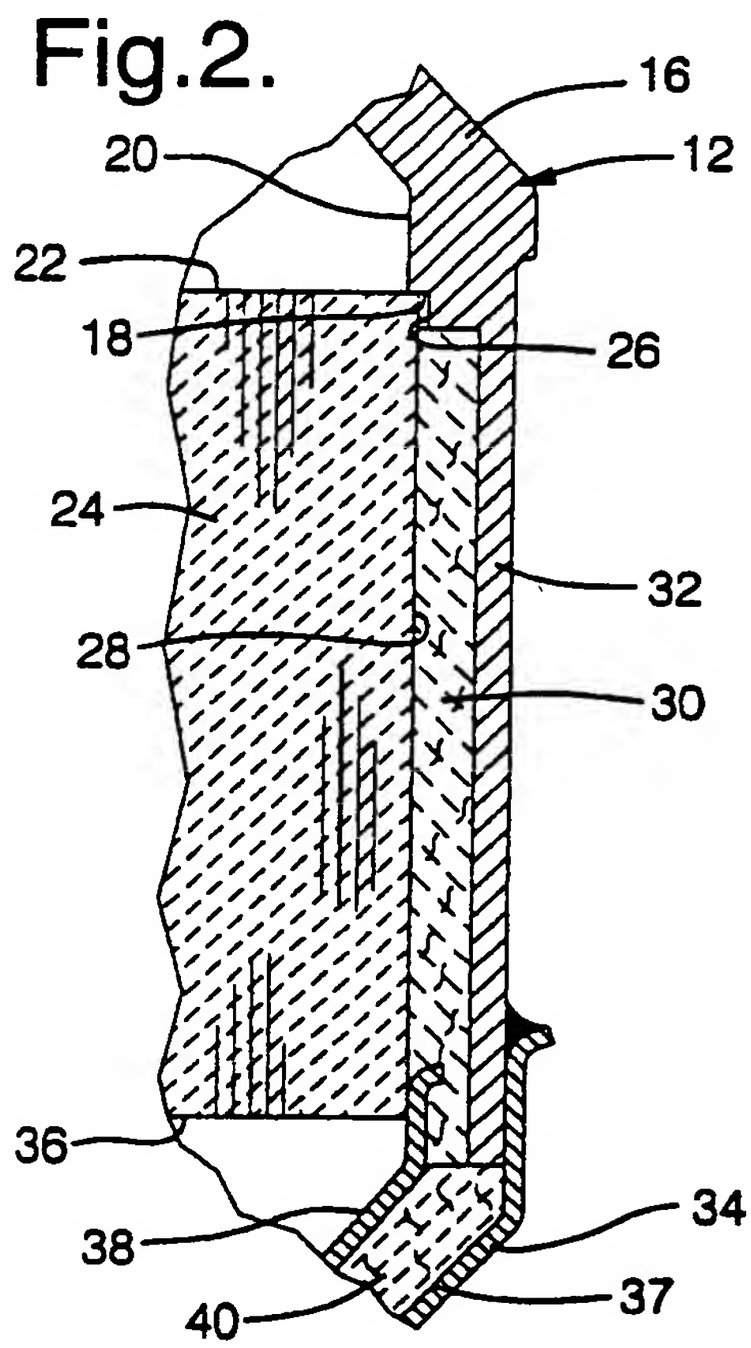
(54) Manifold converter

(57) The present invention includes a manifold catalytic converter (12). The catalytic converter is positioned immediately adjacent the manifold (14). The manifold (14) and the converter end cone (16) are cast from a single integral piece. The manifold/converter end cone casting includes an end cone portion (16) having an end cone wall (20) having a shoulder (18) formed therein for engaging the front face (22) of a catalytic converter substrate (24). A lip (26) or ledge extends from the shoulder (18) and surrounds and engages the outer surface (28) of the ceramic substrate (24) immediately adjacent the front face (22) of the substrate (24). A metal shell is connected to the end cone (16) and is spaced apart from the ceramic substrate (24). A support material (30) is provided between the ceramic substrate (24) and the metal shell. A second end cone is connected to the shell.

Fig.2.



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Description

Field of the Invention

This invention relates to catalytic converters for a combustion engine, and more particularly, to a catalytic converter having a portion thereof integrated into the exhaust manifold.

Background of the Invention

Common exhaust systems for a combustion engine include a manifold connected to the combustion engine at one end and bolted to an exhaust pipe at the other end. The exhaust pipe extends a distance from the manifold and has a catalytic converter system bolted thereto. These catalytic converter systems include a ceramic substrate having a catalyst coated thereon and a metal housing surrounding the substrate. A support mat is placed between the ceramic substrate and the metal housing. Although the ceramic substrate expands and contracts relatively little during operation of the combustion engine, the metal housing expands and contracts greatly. The mat support expands and contracts with heat to keep the ceramic substrate held firmly in the converter housing.

As the catalytic converter is moved closer to the engine, the difference in thermal expansion between the housing and the ceramic substrate becomes exacerbated. Further, as the converter system is moved closer to the combustion engine, the converter system sees violent pressure pulsations. These violent pressure pulsations tend to erode and damage the mat support. This may result in damage to the ceramic substrate since the mat would no longer be able to keep the substrate in place or may cause it to become dislodged. Once dislodged, the substrate will be broken up into pieces due to vibrations and blown downstream.

The present invention provides advantages over the prior art.

SUMMARY OF THE INVENTION

The present invention includes a manifold catalytic converter. The catalytic converter is positioned immediately adjacent the manifold. The manifold and the converter end cone are cast from a single integral piece and are not bolted together. The manifold/converter end cone casting includes an end cone wall having a shoulder formed therein for engaging the front face of a catalytic converter substrate. A lip or ledge extends from the shoulder and surrounds the outer surface of the ceramic substrate immediately adjacent the front face of the substrate. This lip or ledge provides a pressure pulsation barrier so the mat will not erode. A housing for the ceramic substrate is provided and is spaced apart from the ceramic substrate. A resilient support material is provided between the ceramic substrate and the housing. A second end cone is connected to the housing.

These and other objects, features and advantages will be apparent from the following brief description of the drawings, detailed description and appended drawings and claims.

Brief Description of the Drawings

Figure 1 is a schematic illustration of a combustion engine including a manifold converter according to the present invention; and
Figure 2 is a partial sectional view taken along line 2-2 of a manifold catalytic converter according to the present invention.

Detailed Description

Figure 1 is a schematic illustration of a combustion engine 10 and exhaust system used in an automobile or truck. The combustion engine 10 has a manifold catalytic converter 12 according to the present invention attached thereto. The manifold catalytic converter as shown in Figure 2 is a single piece integral casting including a manifold 14 and catalytic converter end cone 16. The end cone portion 16 of the manifold catalytic converter includes a shoulder 18, preferably extending out at a right angle to a portion of the end cone wall 20 (Figure 2). The shoulder is formed to engage the front face 22 of a catalytic converter substrate 24 which has a catalyst coated thereon. A lip 26 extends from the shoulder, preferably at a right angle. The lip 26 surrounds a portion of the outer surface 28 of the ceramic substrate at a location immediately adjacent the front face 22 of the ceramic substrate. A substrate housing 32 extends from the end cone and is spaced a distance from the ceramic substrate. The substrate housing 32 may also be a part of the single piece integral casting or it may be a separate metal shell which is attached to the end cone 16. A resilient support mat 30 is provided between the ceramic substrate 24 and the substrate housing 32 to compensate for thermal expansion and contraction of the housing. A suitable support mat is available from 3M company under the trade name Intumescent Mat Support. A second end cone 34 is attached to the housing 32 at a location near the rear face 36 of the ceramic substrate. The second end cone may have two spaced apart walls 37, 38 and a second mat insulation 40 carried therebetween.

The manifold catalytic converter 12 of the present invention places the catalytic converter substrate and catalyst immediately adjacent the manifold 14 and engine 10. The temperatures of the exhaust gas at this location are relatively high as compared to traditional exhaust system arrangements wherein the converter is spaced a substantial distance downstream from the engine and manifold. This provides for rapid lightoff of the catalyst. The shoulder 18 and lip 26 of the single cast end cone portion prevents high pressure and high variation exhaust flows from impinging on the support mat 30 and thus eliminates any possibility that the mat

will be eroded or deteriorated. The manifold catalytic converter of the present invention eliminates a variety of bolts and flanges, and allows for a smaller packaging envelope which reduces the overall distance of the exhaust system which is particularly advantageous for smaller vehicles. As used herein, the term single piece integral casting means a component that is cast as one single piece and does not include two or more parts bolted or welded together.

Claims

1. A manifold catalytic converter comprising:

   a single piece-integral casting comprising a manifold and a first converter end cone;
   an end cone portion of the single piece-integral casting having a shoulder formed in an end cone wall, said shoulder being constructed and arranged to engage the front face of a catalytic converter substrate having a catalyst coated thereon;
   a lip extending from the shoulder and surrounding an outer surface of the ceramic substrate immediately adjacent the front face of the ceramic substrate;
   a shell extending from the end cone portion to house said substrate, said shell being spaced a distance from the ceramic substrate;
   a support material positioned between the metal shell and ceramic substrate; and
   a second end cone attached to the ceramic shell near a rear face of the ceramic substrate.

2. A manifold catalytic converter as set forth in claim 1 wherein said single piece-integral casting further comprises said shell.

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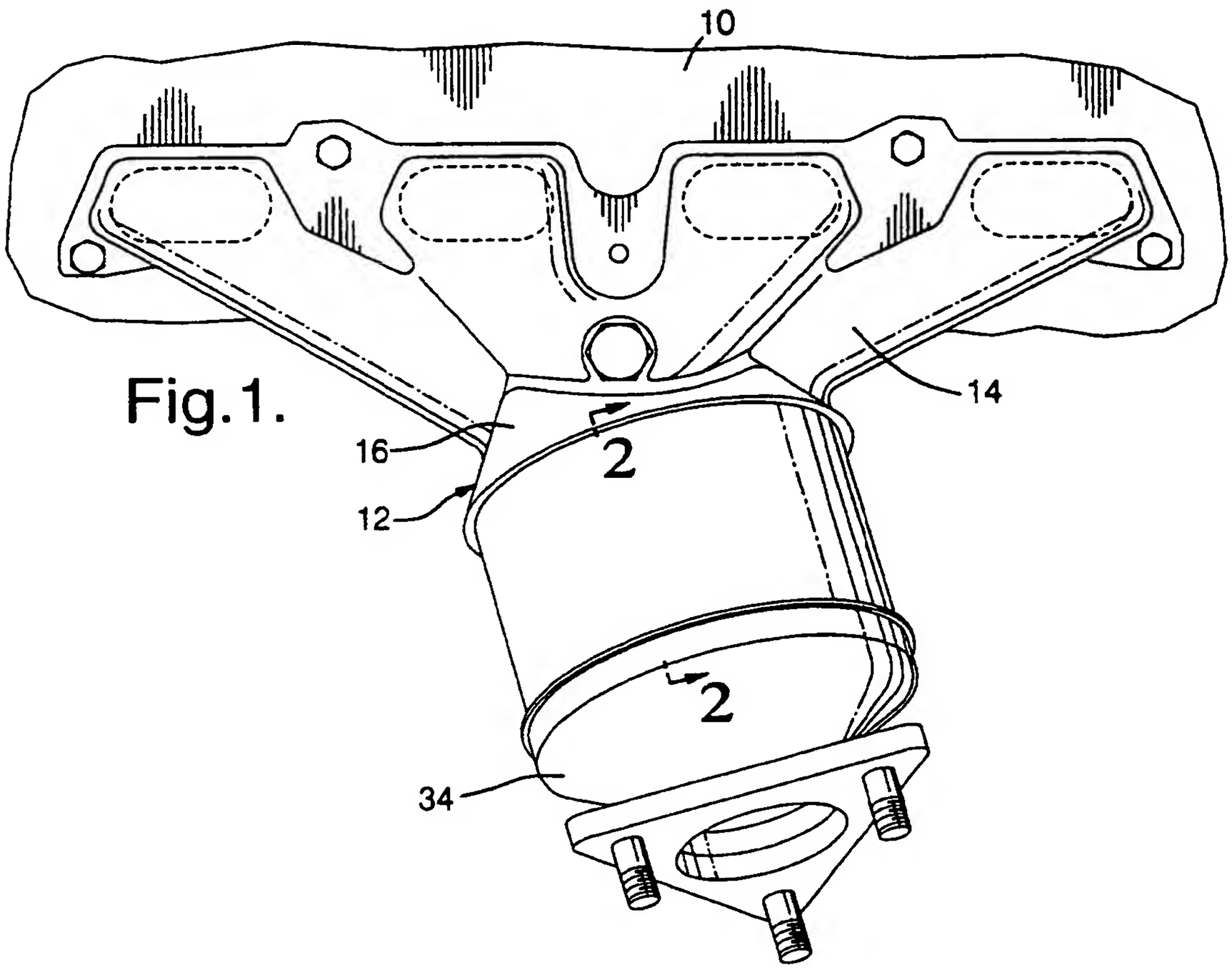
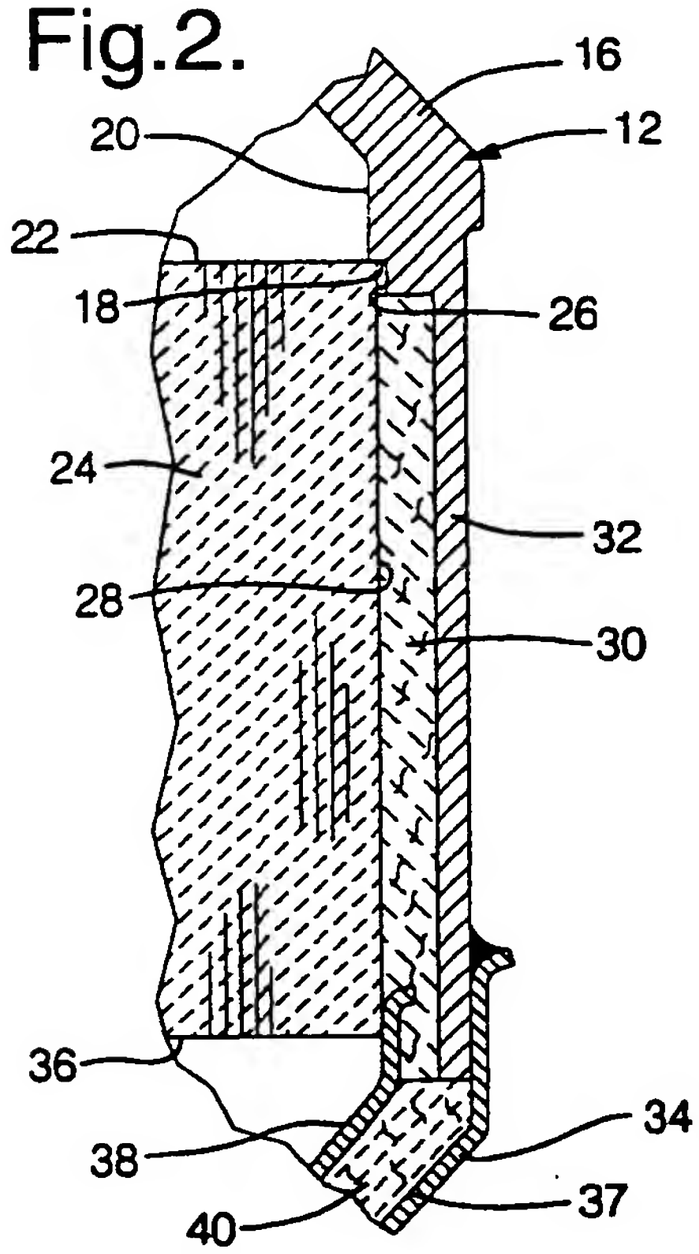


Fig.1.

Fig.2.



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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 1897

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 7, no. 68 (M-201), 19 March 1983 & JP-A-57 210117 (TOYOTA JIDOSHA), 23 December 1982, * abstract * ---	1,2	F01N7/10 F01N3/28
A	PATENT ABSTRACTS OF JAPAN vol. 7, no. 126 (M-219), 31 May 1983 & JP-A-58 044211 (YAMAHA HATSUDOKI), 15 March 1983, * abstract * ---	1,2	
A	US-A-4 261 170 (SUZUKI) * column 3, line 57 - line 61; figure 4 * ---	1,2	
A	EP-A-0 117 602 (GENERAL MOTORS CORPORATION) * page 5, line 4 - line 33; figure 2 * ---	1	
A	EP-A-0 256 416 (LEISTRITZ) * column 9, line 6 - line 19 * * column 10, line 27 - line 34; figure 7 * ---	1	
A	DE-U-92 10 836 (HEINRICH GILLET GMBH & CO KG) ---		
A	FR-A-2 422 028 (FUJI JUKOGYO) -----		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F01N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 November 1996	Friden, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Manifold converter

Publication number: EP0761939
Publication date: 1997-03-12
Inventor: HENRY MATTHEW MEREDITH (US)
Applicant: GEN MOTORS CORP (US)
Classification:
- international: ***F01N3/28; F01N7/10;*** *F01N7/18;* **F01N3/28; F01N7/10;** F01N7/18; (IPC1-7): F01N7/10; F01N3/28
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Application number: EP19960201897 19960708
Priority number(s): US19950515724 19950816

Also published as:
US6605259 (B1)

Cited documents:
US4261170
EP0117602
EP0256416
DE9210836U
FR2422028
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Abstract of **EP0761939**

The present invention includes a manifold catalytic converter (12). The catalytic converter is positioned immediately adjacent the manifold (14). The manifold (14) and the converter end cone (16) are cast from a single integral piece. The manifold/converter end cone casting includes an end cone portion (16) having an end cone wall (20) having a shoulder (18) formed therein for engaging the front face (22) of a catalytic converter substrate (24). A lip (26) or ledge extends from the shoulder (18) and surrounds and engages the outer surface (28) of the ceramic substrate (24) immediately adjacent the front face (22) of the substrate (24). A metal shell is connected to the end cone (16) and is spaced apart from the ceramic substrate (24). A support material (30) is provided between the ceramic substrate (24) and the metal shell. A second end cone is connected to the shell.

Fig.2.